An integrated unit focusing on the management decisions regarding one of Arizona's major predators

Mountain Lions in Arizona

Lesson 2: The Lion as Predator – Feast of Plenty

LESSON OVERVIEW

In this lesson, students will learn the basics of a mountain lion's diet by researching one of its possible food chains and the subsequent food web. Each student will be assigned one of the mountain lion's prey species and asked to construct a food chain using that animal. Students will present their food chains to the class so they can all see the diverse resources required to keep mountain lions alive. Then, students will combine food chains to make a food web in order to understand how a small change in one part of the ecosystem can have a dramatic impact on all of the species.

SUGGESTED GRADE LEVELS

- 6 – 12

ENDURING UNDERSTANDINGS

- All energy in an ecosystem comes from the sun.
- Animals eat food to obtain the energy necessary for survival.
- Changes to one part of an ecosystem can affect all other parts of that ecosystem.
- Specialists are species that depend on one particular food to survive; generalists are capable of surviving on a variety of food types.

OBJECTIVE

Students will:

- Use the Internet to research specific information about an animal.
- Create a food chain for a mountain lion.
- Present a food chain.
- Create a food web.
- Analyze the effects of changes in the food web.

ARIZONA DEPARTMENT OF EDUCATION STANDARDS

Grade	Science	Social Studies
6	S4-C3-01	None
7	S4-C3-01; S4-C3-02; S4-C3-05; S4-C3-06	None
8	S4-C4-01; S4-C4-02	None
High School	S4-C3-01; S4-C4-04; S4-C5-04	None

Note: The full text of these standards can be found in Appendix A.

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TIME FRAME

- 3 days (45 minutes each day)

MATERIALS

- *Food Chain of a Mountain Lion* worksheet (1 per student)
- *Food Web of a Mountain Lion* worksheet (1 per student)
- Internet access or printouts of animal fact sheets
- Construction paper
- Markers, crayons, or colored pencils
- Scissors
- Glue and/or tape

TEACHER PREPARATION

- Make copies of both worksheets for each student.
- Gather art materials.
- If no Internet access is available to students, visit some of the Web sites to print out fact sheets on the assigned animals for students to use for research.

SUGGESTED PROCEDURES

1. Ask students: What types of food does a mountain lion eat? They can answer in the form of a journal entry or a class discussion. Discuss some student answers. Explain that scientists have discovered that mountain lions have a very diverse diet.
2. Hand out the *Food Chain of a Mountain Lion* worksheet.
3. Read the worksheet individually or as a class.
4. Assign each student one of the prey animals to research. Some animals may be assigned to more than one student. Explain that when they have become familiar with their animal, they will make a food chain with it that shows the mountain lion at the top and the foods that their prey animal eats at the bottom. They should illustrate their food chain with drawings or photos. Emphasize that they will be presenting this information to the class, so the food chain should be large enough for everyone to see easily. Appendix B provides suggested Web sites for student research.
5. Allow the students to work. If they do not finish in class, they can complete the assignment as homework.
6. When all students have finished, begin the presentations. Each presentation should include a brief description of the animal, its habitat, and an explanation of the food chain the student created. If several students are presenting the same animal, discuss any similarities or differences among their food chains.
7. After all presentations have been completed, allow time for students to answer the questions at the end of the *Food Chain of a Mountain Lion* worksheet. If they do not finish in class, they can complete the assignment as homework. Collect the worksheet when students have finished.
8. Begin the food-web component by handing out the *Food Web of a Mountain Lion* worksheet.
9. Read the worksheet individually or as a class.

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10. Explain that students will now make a food web by combining five food chains presented in class. One of the chains must be their own, but the other four can belong to any other student as long as four different organisms are used.
11. Allow the students to work on their food webs and answer the questions on the worksheet.
12. When all students have finished, discuss the questions. Be sure to emphasize that small changes to the environment can result in drastic changes to the entire ecosystem and the animals in it.
13. Collect the food webs and the *Food Web of a Mountain Lion* worksheets.

ASSESSMENT

- Student-generated food chain
- Student-generated food web
- *Food Chain of a Mountain Lion* worksheet
- *Food Web of a Mountain Lion* worksheet
- Class discussion

EXTENSIONS

- Students can research the diets of some of the other large predators found in Arizona (i.e., Mexican wolves, black bear, and jaguar) to see if they can determine the types of habitats in which each lives.
- Encourage your students to participate in the *Hot Topics Campfire Chat* with their parents at home.

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Appendix A: Arizona Department of Education Standards – Full Text

Science Standards

Grade	Strand	Concept	Performance Objective
6	4	3 – Populations of Organisms in an Ecosystem	1 – Explain that sunlight is the major source of energy for most ecosystems
7	4	3 – Populations of Organisms in an Ecosystem	1 – Compare food chains in a specified ecosystem and their corresponding food web 2 – Explain how organisms obtain and use resources to develop and thrive in predator/prey relationships 5 – Predict how environmental factors affect survival rates in living organisms 6 – Create a model of the interactions of living organisms within an ecosystem
8	4	4 – Diversity, Adaptation and Behavior	1 – Explain how an organism's behavior allows it to survive in an environment 2 – Describe how organisms are influenced by a particular combination of biotic and abiotic factors in an environment
High School	4	3 – Populations of Organisms in an Ecosystem	1 – Identify relationships among organisms within populations, communities, ecosystems, and biomes.
		4 – Biological Evolution	4 – Explain how a change in an environmental factor can affect the number and diversity of species in an ecosystem
		5 – Matter, Energy, and Organization in Living Systems	4 – Diagram the energy flow in an ecosystem through a food chain

Appendix B: Suggested Research Web Sites

Below are some suggested Web sites that students may use for research. It is recommended that you review the Web sites before using them with students:

- *eNature* – your students will need to search the database for their selected animal
  - http://www.enature.com/home/
- *Desert Animal and Wildlife* – a general site where about half of the animals can be found
  - http://www.desertusa.com/animal.html
- *Southwest Wildlife Factsheets* – a general site where about some of the animals can be found
  - http://www.southwestwildlife.org/factsheets/factsheets.htm
- *Plant and Animal Abstracts* – scientific reports for some of the animals, but it is intended for an older audience
  - http://www.azgfd.gov/w_c/edits/hdms_abstracts.shtml

Appendix C: Worksheets and Overheads

The pages that follow contain the worksheets listed below:

A. *Food Chain of a Mountain Lion* – Provides directions for the students to research and create a food chain. Poses questions regarding food chains and provides space for answers. (1 page)

B. *Food Web of a Mountain Lion* – Provides directions for the students to combine food chains to create a food web. Poses questions regarding food webs and provides space for answers. (1 page)

Food Chain of a Mountain Lion

Although mountain lions tend to prey on large mammals, such as deer and elk, they will also eat smaller mammals, reptiles, and even insects if necessary. They have even been known to prey on livestock, such as cattle and pigs, if available. Table 1 shows a partial list of prey animals.

Table 1: Arizona Animals Preyed on by Mountain Lions

Mule Deer	Coyote	White-tailed Deer	Cottontail Rabbit	Elk	Skunk
Bighorn Sheep	Ground Squirrel	Pronghorn	Raccoon	Javelina	Woodrat
Porcupine	Coati	Black Bear	Wild Burro	Bobcat	Wild Turkey

Using the Web sites provided by your teacher or your own resources, research the animal that you have been assigned. You should be able to provide a description of the animal as well as its major habitat. You will also need to know which plants and/or animals your animal eats.

Based on this research, make a food chain starting with the mountain lion at the top. Be aware that your animal will probably eat more than one food item and you need to show all of those items on your chain. In addition, if any of those food items is also a predator, you must show the items that predator eats. For example, if the black bear eats fish you will also need to show what the fish eat. Be sure to include drawings or photos of the animals and plants that you have included on your food chain.

When all of the presentations have been completed, answer the following questions. If you run out of space, continue your answers on the back.

1. In an ecosystem, animals play various roles. Use any resources available to help you define the following roles: producer, consumer, primary consumer, decomposer, predator, and prey. Give an example of each one from the animals above.

2. Trophic (nutritional) levels are defined as the various levels of a food chain. Based on the roles above, what types of organisms are found at the highest trophic levels? What types of organisms are found at the lowest trophic levels?

3. Where do organisms at the highest trophic level get their energy? Where do organisms at the lowest trophic level get their energy?

4. Energy is lost as you advance through a food chain. Some estimates say that as you move up to the next trophic level, you lose 10% of the energy. Based on this estimate, how much energy is left by the time you reach the top of the food chain you created?

5. A mountain lion is referred to as a "top predator." What do you think this means?

Food Web of a Mountain Lion

In the previous activity, you saw the wide variety of food that the mountain lion can eat. In particular, you looked at one prey item. However, the mountain lion exists in an ecosystem that includes a number of animals and plants. Scientists have suggested that the addition or removal of an animal from an ecosystem can affect many other animals and plants. You will have the opportunity to explore this idea by looking at a mountain lion's food web. While a food chain is a sequence that shows the transfer of energy from one organism to another, a food web is a complex network of food chains that shows the relationship between multiple species in an ecosystem.

Choose five food chains that were presented in class (yours and four others). Create a food web that links all of these food chains together. Be sure to include all of the animals and plants that were shown on the original chains, and be sure all of the links are completed. For example, you may find that more than one animal eats grass. As a result, you should have more than one link to the grass.

When finished, answer the questions below. If you run out of space, continue your answers on the back of this page.

1. Animals can serve a variety of roles in an ecosystem. These include predator, prey, producer, consumer, primary consumer, and decomposer. Based on your food web, what roles does the mountain lion play in this ecosystem? How do you know?

2. If above-average precipitation occurred one year causing a significant increase in the amount of grass available, what effect would this have on the other animals and plants in the ecosystem?

3. If the mountain lion were removed from the ecosystem, what might be the immediate effects on the other animals and plants? What might be the long-term effects?

4. The mountain lion is a true survivor. For many years, the United States government endorsed a program to eliminate this large predator. Although the program met with limited success, the mountain lion is still common in the western states. Explain why its diverse diet helps it survive.

5. The black-footed ferret is a small mammal similar to a weasel. Like the mountain lion, the ferret is a predator. However, it feeds on only one animal — the prairie dog. The black-footed ferret is one of the most endangered mammals in North America. In fact, it was once thought to be extinct. Explain why its limited diet may have an impact on its survival.

6. "Generalist" and "specialist" are two words used to describe animals based on their food variety. What do you think these terms mean? Which word describes mountain lions? Which describes black-footed ferrets?